CLAIMS

1. An apparatus, comprising:

a settling chamber having a top section and bottom section;

an outlet port positioned on the top section; and

an inlet port positioned on the bottom section; wherein a ratio of height to width of the settling chamber is greater than 0.7.

2. The apparatus of claim 1, wherein the ratio of height to width of the settling chamber is greater than 1.2.

3. The apparatus of claim 1, wherein the bottom section comprises:

a base;

an inlet port connected to the sidewall; and

the ratio of the size of the base to the size of the inlet port is approximately 4 to 1.

4. The apparatus of claim 3, wherein the inlet port is located approximately one half the inlet port size (diameter) higher than the base.

5. The apparatus of claim 3, wherein the base is circular.

6. The apparatus of claim 3, wherein the sidewall is cylindrical.

7. The apparatus of claim 1, wherein the inlet port is generally circular and a central axis of the inlet port is perpendicular to a central axis of the sidewall.

8. The apparatus of claim 6, wherein the inlet port is generally circular and a ratio of a diameter of the sidewall to a diameter of the inlet port is 4 to 1.

9. The apparatus of claim 1, wherein the inlet port is generally circular and a ratio of the height of the settling chamber to a diameter of the inlet port is greater than 2.8.

10. The apparatus of claim 9, wherein the ratio of the height of the settling chamber to the diameter of the inlet port is greater than 4.8.

11. The apparatus of claim 1, wherein the inlet port and the outlet port are generally circular and a ratio of the diameter of the inlet port to a diameter of the outlet port is 3 to 1.

12. The apparatus of claim 1, wherein the top section has a frustoconical shape.

13. The apparatus of claim 12, wherein the top section has a cone angle of 90 degrees.

14. The apparatus of claim 12, wherein the outlet port is located at a top portion of the frustoconical shape.

15. The apparatus of claim 1, wherein the apparatus is constructed of stainless steel.

16. The apparatus of claim 1, wherein the inlet port is welded to the settling chamber.

17. A method of using a settling chamber, comprising:

providing the settling chamber with a top section and a bottom section, an outlet port positioned on the top section, and an inlet port positioned on the bottom section, wherein a ratio of height to width of the settling chamber is greater than 0.7;

introducing a gas fluidized particle stream through the inlet port at a given volume flow rate;

establishing a gas stream flow pattern within the settling chamber that retards transportation of one group of particles to the outlet port and facilitates transportation of another group of particles to the outlet port; and

collecting the other size of particles at the outlet port.

18. The method of claim 17, wherein the one group of particles has particles less than 10 microns and the other group of particles has particles greater than 10 microns.

19. The method of claim 17, wherein the step of establishing comprises:

establishing a main recirculating flow pattern in the bottom section; and

establishing a secondary recirculating flow pattern in the top section.

20. The method of claim 19, further comprising creating an interface between the main recirculating flow pattern and the secondary recirculating flow pattern.

21. The method of claim 17, wherein the step of establishing comprises:

establishing a main recirculating flow pattern in the bottom section; and

establishing a secondary, sympathetic recirculation flow pattern in the top section;

wherein the axes of rotation of both recirculating flow patterns are primarily horizontal and substantially perpendicular to the inlet stream.

22. The method of claim 17, wherein the step of introducing comprises radial introduction of the gas fluidized particle stream into the settling chamber.

23. The method of claim 17, wherein the step of introducing comprises introducing the gas fluidized particle stream at a given volume flow rate of 10-1000 scfm.

24. The method of claim 23, wherein the step of introducing comprises introducing the gas fluidized particle stream at a given volume flow rate of 100-200 scfm.

25. The method of claim 17, wherein the step of introducing comprises introducing a gas fluidized particle stream comprising one of metal oxide nanoparticles, metal nanopowders, metal nitride, mixed metal oxides, metal carbides and metal sulfide nanoparticles.

26. The method of claim 17, wherein the step of introducing comprises introducing a gas fluidized particle stream comprising particles having a minimum particle size of approximately .001 micron.

27. The method of claim 17, wherein the step of introducing comprises introducing a gas fluidized particle stream comprising free particles.

28. The method of claim 17, wherein the step of introducing comprises introducing a gas fluidized particle stream comprising particle clusters.

29. The method of claim 17, wherein the step of introducing comprises introducing a gas fluidized particle stream comprising free particles and particle clusters.

30. The method of claim 17, further comprising selecting the bottom section to be cylindrical.

31. The method of claim 30, further comprising selecting a diameter of the bottom section to be 48 inches.

32. The method of claim 31, wherein the step of introducing comprises introducing a gas fluidized particle stream at a volume flow rate of at least 10 scfm.

33. The method of claim 31, wherein the step of introducing comprises introducing a gas fluidized particle stream at a volume flow rate no greater than 1000 scfm.

34. A system, comprising:

means for introducing a gas fluidized particle stream into a settling chamber; and

means for establishing a gas stream flow pattern within the settling chamber that retards transportation of one group of particles to an outlet port and facilitates transportation of another group of particles to the outlet port.

35. The system of claim 34, wherein the one group of particles consists of particles having a size less than 10 microns and the other group of particles consists of particles having a size greater than 10 microns.

36. The system of claim 34, wherein the means for establishing comprises:

means for establishing a main recirculating flow pattern; and

means for establishing a secondary recirculating flow pattern.

37. The system of claim 36, further comprising means for creating an interface between the main recirculating flow pattern and the secondary recirculating flow pattern.

38. The system of claim 34 , further comprising:

a means for establishing a main recirculating flow pattern; and

a means for establishing a secondary, sympathetic recirculation flow pattern, where the axes of rotation of both recirculating flow patterns are primarily horizontal and substantially perpendicular to the inlet stream.

39. The system of claim 34, further comprising radial introduction of the gas fluidized particle stream into the settling chamber.

40. The system of claim 34, wherein the means for introducing comprises means for introducing the gas fluidized particle stream at a given volume flow rate of 10-1000 scfm.

41. The system of claim 40, wherein the means for introducing comprises means for introducing the gas fluidized particle stream at a given volume flow rate of 100-200 scfm.

42. The system of claim 34, wherein the means for introducing comprises means for introducing a gas fluidized particle stream comprising one of metal oxide nanoparticles, metal nanopowders, metal nitride, mixed metal oxides, metal carbides and metal sulfide nanoparticles.

43. The system of claim 34, wherein the means for introducing comprises means for introducing a gas fluidized particle stream comprising particles having a minimum particle size of approximately .001 micron.

44. The system of claim 34, wherein the means for introducing comprises means for introducing a gas fluidized particle stream comprising free particles.

45. The system of claim 34, wherein the means for introducing comprises means for introducing a gas fluidized particle stream comprising particle clusters.

46. The system of claim 34, wherein the means for introducing comprises introducing a gas fluidized particle stream comprising free particles and particle clusters.